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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/531,715	04/18/2005	Takeshi Kuwabara	F-8643	1453

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EXAMINER	
MERKLING, MATTHEW J	

ART UNIT	PAPER NUMBER
1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/531,715	KUWABARA ET AL.
	Examiner	**Art Unit**
	MATTHEW J. MERKLING	1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 December 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16,24 and 26-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16,24 and 26-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi et al. (US 5,094,926) in view of Maruko (EP 1094030 A2) as evidenced by Negishi (US 6,165,633).

Regarding claim 1, Kobayashi discloses self-oxidation internal heating steam reforming system (abstract) comprising:

a steam generator (evaporator, (38)) comprising a combustion chamber (30) for combusting an air-fuel mixture obtained by mixing a combustion air (46) with a fuel (41a), thereby heating water by a combustion gas generated in the combustion section to generate steam (See Fig. 1 Flow diagram);

a first sucking mixer (ejector, (34)) for sucking a raw material gas (35) into a steam stream (40) coming from the steam generator (38); and

a reformer (26) for oxidizing the raw material gas contained in the raw material-steam mixture by an oxygen-containing gas (compressed air, (41b)) supplied externally (see Fig. 1).

Kabayashi, however, does not go into specifics about the exact design of said reformer (48).

Maruko also discloses a reformer.

Maruko teaches a reformer that comprises:

a first reaction chamber (51) and a second reaction chamber (24, 25, 52) separated from each other by partition walls (2);

the first reaction chamber (51) is provided with a first reaction chamber raw material feed section (49) for supplying the raw material-steam mixture (paragraph 40) at a first reaction chamber first end (see Fig. 5) and a first reaction chamber discharge section (4) at a first reaction chamber second end, respectively, while packing a steam reforming catalyst bed (paragraph 41) therein; and

the second reaction chamber (24, 25, 52) is provided with a second reaction chamber raw material feed section (38) communicating with the first reaction chamber discharge section (4, see flow directions in Fig. 5), and a second reaction chamber discharge section (23), respectfully, where the inside of the second reaction chamber is packed with a mixed catalyst bed (52, steam reforming catalyst and oxidizing catalyst, see abstract) at a

second reaction chamber feed section side (see FIg. 5), and a shift catalyst bed (25) at a second reaction chamber discharge side;

the second reaction chamber (24, 25, 52) is provided with an oxygen-containing gas introduction section (38) communicating with the first reaction chamber discharge section (4, see Fig. 5) at said first reaction chamber second end (see Fig. 5); and

the second reaction chamber (24, 25, 52) is provided with a heat transfer particle bed (24, where heat from particle bed 24, which also performs a shift reaction, is transferred through partition wall 2, to reforming catalyst bed 51) at a middle section between said mixed catalyst bed (52) and said shift catalyst bed (25);

the first reaction chamber (51) is packed with a heat-transfer particle bed (52', where heat is transferred between shift bed 25 and particle transfer bed 52' through partition wall 2) at the raw material feed section side, a steam reforming catalyst bed (51) at the discharge section side, while making the heat transfer particle bed in the first reaction chamber, the heat transfer particle bed in the second reaction chamber, and the shift catalyst bed face with each other via the respective partition walls (see Fig. 5) that extend up to the top of said second reaction chamber and preheat the incoming gas (see Fig. 5, 33); and

the ends of the partition walls (2) at a first reaction chamber raw material feed section side (see Fig. 5) and a second reaction chamber discharge side (23) are first fixed ends (see FIg. 5 where partition walls are fixed) where the

partition walls are joined to each other, respectively, while second ends of the partition walls (38) form free ends where there are no joined ends (see Fig. 5).

Maruko teaches this reforming configuration as a means to reduce energy cost of operating a reformer and reduce the development and emission NOx which is a known pollutant as well as more efficiently utilizing the thermal energy of the reformer (paragraph 4).

It would have been obvious to one of ordinary skill in the art at the time of the inventions to change the reformer structure of Kobayashi with a fist and second reaction chamber, as taught by Maruko in order to reduce energy cost of operating a reformer and reduce the development and emission NOx.

Furthermore, Kobayashi, as modified by Maruko, teaches a reforming catalyst section (51) that is in thermal contact with an oxidation/reforming catalyst section (52), but does not teach these two sections are thermally insulated from each other, as claimed.

However, Maruko teaches a heated reformate stream (exiting reforming section 51 at discharge 4) entering a second oxidation zone (52). In other words, the discharge stream of the reforming zone 51, is hot, and it then enters another oxidizing zone (52). It was well known in the art at the time of the invention that excessive temperatures in the reforming catalyst can cause deterioration of the catalyst, as well as deterioration of the structure (see Negishi US 6,165,633 col. 20 line 64 – col. 21 line 4, and Maruko paragraph 3).

As such, it would have been obvious to one of ordinary skill in the art at the time of the invention to add the insulating means at a second portion of the partition walls (2 of Maruko) of modified Kobayashi (between sections 52 and 51 of Maruko) in order to prevent excessive temperatures from the oxidation in the mixed catalyst section from transferring to the reforming catalyst section and causing deterioration of the reforming catalyst,

4. Claims 1-16, 24 and 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tetsuo (JP 10-308230) in view of Maruko (EP 1094030 A2) as evidenced by Negishi (US 6,165,633).

Regarding claim 1, 12-14, 24, 27 and 28, Tetsuo discloses a self-oxidation internal heating steam reforming system (abstract) comprising:

a steam generator (boiler, (6)) comprising a combustion section (burner, (10)) for combusting an air-fuel mixture obtained by mixing a combustion air (94) with a fuel (town gas, (4) and fuel cell exhaust gas (13)), thereby heating water by a combustion gas generated in the combustion section to generate steam ([0003]);

a first sucking mixer (ejector, (53)) for sucking a raw material gas (4) into a steam stream (31) coming from the steam generator (6); and

a reformer (48) for oxidizing the raw material gas contained in the raw material-steam mixture by an oxygen-containing gas (compressed air, (89)) supplied externally (see Drawing 3); and

a self-oxidation internal heating steam reforming system, with reformed gas supplied to a fuel cell (21), and anode flue gas discharged from the fuel cell is supplied (via conduit 13) to the fuel of the steam generator.

Tetsuo, however, does not go into specifics about the exact design of said reformer (48).

Maruko also discloses a reformer.

Maruko teaches a reformer that comprises:

a first reaction chamber (51) and a second reaction chamber (24, 25, 52) separated from each other by partition walls (2);

the first reaction chamber (51) is provided with a first reaction chamber raw material feed section (49) for supplying the raw material-steam mixture (paragraph 40) at a first reaction chamber first end (see Fig. 5) and a first reaction chamber discharge section (4) at a first reaction chamber second end, respectively, while packing a steam reforming catalyst bed (paragraph 41) therein; and

the second reaction chamber (24, 25, 52) is provided with a second reaction chamber raw material feed section (38) communicating with the first reaction chamber discharge section (4, see flow directions in Fig. 5), and a second reaction chamber discharge section (23), respectfully, where the inside of the second reaction chamber is packed with a mixed catalyst bed (52, steam reforming catalyst and oxidizing catalyst, see abstract) at a second reaction chamber feed section side (see FIg. 5), and a shift catalyst bed (25) at a second reaction chamber discharge side;

the second reaction chamber (24, 25, 52) is provided with an oxygen-containing gas introduction section (38) communicating with the first reaction chamber discharge section (4, see Fig. 5) at said first reaction chamber second end (see Fig. 5); and

the second reaction chamber (24, 25, 52) is provided with a heat transfer particle bed (24, where heat from particle bed 24, which also performs a shift reaction, is transferred through partition wall 2, to reforming catalyst bed 51) at a middle section between said mixed catalyst bed (52) and said shift catalyst bed (25);

the first reaction chamber (51) is packed with a heat-transfer particle bed (52', where heat is transferred between shift bed 25 and particle transfer bed 52' through partition wall 2) at the raw material feed section side, a steam reforming catalyst bed (51) at the discharge section side, while making the heat transfer particle bed in the first reaction chamber, the heat transfer particle bed in the second reaction chamber, and the shift catalyst bed face with each other via the respective partition walls (see Fig. 5) that extend up to the top of said second reaction chamber and preheat the incoming gas (see Fig. 5, 33); and

the ends of the partition walls (2) at a first reaction chamber raw material feed section side (see Fig. 5) and a second reaction chamber discharge side (23) are first fixed ends (see FIg. 5 where partition walls are fixed) where the partition walls are joined to each other, respectively, while second ends of

the partition walls (38) form free ends where there are no joined ends (see Fig. 5).

Maruko teaches this reforming configuration as a means to reduce energy cost of operating a reformer and reduce the development and emission NOx which is a known pollutant as well as more efficiently utilizing the thermal energy of the reformer (paragraph 4).

It would have been obvious to one of ordinary skill in the art at the time of the inventions to change the reformer structure of Tetsuo with a fist and second reaction chamber, as taught by Maruko in order to reduce energy cost of operating a reformer and reduce the development and emission NOx.

Furthermore, Tetsuo, as modified by Maruko, teaches a reforming catalyst section (51) that is in thermal contact with an oxidation/reforming catalyst section (52), but does not teach these two sections are thermally insulated from each other, as claimed.

However, Maruko teaches a heated reformate stream (exiting reforming section 51 at discharge 4) entering a second oxidation zone (52). In other words, the discharge stream of the reforming zone 51, is hot, and it then enters another oxidizing zone (52). It was well known in the art at the time of the invention that excessive temperatures in the reforming catalyst can cause deterioration of the catalyst, as well as deterioration of the structure (see Negishi US 6,165,633 col. 20 line 64 – col. 21 line 4, and Maruko paragraph 3).

As such, it would have been obvious to one of ordinary skill in the art at the time of the invention to add the insulating means at a second portion of the

partition walls (2 of Maruko) of modified Tetsuo (between sections 52 and 51 of Maruko) in order to prevent excessive temperatures from the oxidation in the mixed catalyst section from transferring to the reforming catalyst section and causing deterioration of the reforming catalyst,

Regarding claim 2, while Tetsuo discloses the use of a “sucking mixer” (ejector) as a preferable way of controlling the ratio of fuel/air ratio ([0004]), Tetsuo fails to explicitly disclose a second sucking mixer for mixing the fuel and combustion air.

It would have been obvious to one of ordinary skill in the art at the time of the invention to add a second sucking mixer to the fuel and combustion air inlet of the steam generator in order to preferable control the fuel/air ratio.

Regarding claim 3, Tetsuo, as discussed in claim 1 above, further discloses a CO reducer (shift converter, (11)).

Regarding claims 4, Tetsuo, as discussed in claim 1 above, further discloses a heat exchanger (boiler, (10)) configured to heat a heating medium (steam/water) using a combustion flue gas (5, 9) discharged from the combustion section (see Drawings 1, 2, 3, 4).

Regarding claims 5 and 6, Tetsuo, as discussed in claim 1, further discloses a heat exchanger (condenser, (66)) that preheats water for steam generation is located to a reformed gas conduit (see Drawing 3) and located downstream of the CO reducer (11).

Regarding claim 7, Tetsuo, as discussed in claim 1 above, further discloses the steam generation system is constructed such that excess steam can be sent (via conduit (71)) to heat another medium (evaporation of the refrigerant [0037]).

Regarding claim 8, Tetsuo, as discussed in claim 7 above, further discloses the heating medium (61) is water ([0013]) held in a hot water tank (47) in which a main hot water chamber (tank, 47) is communicated with an auxiliary chamber (conduit) and that surplus steam is supplied to be in heat exchange with the auxiliary chamber (see Drawing 1).

Regarding claim 9, Tetsuo, as discussed in claim 1 above, further discloses the reformed gas is supplied to a fuel cell (21).

Regarding claim 10, Tetsuo, as discussed in claim 9 above, further discloses an electrode (anode) flue gas (13) is sent as fuel to the combustion section (10).

Regarding claim 11, Tetsuo, as discussed in claim 10 above, further discloses the system is constructed so as to comprise a mixing section (53) for mixing at least a part of a surplus steam (31) to the anode flue gas of the fuel cell (see Fig. 2); a heat exchanger (34) for dewatering a mixture obtained in the mixing section by cooling the mixture using other heating medium (water from (6)) to condense moisture; and a heat exchanger (29) for reheating the dewatered mixture using the mixture entered the mixing section. Tetsuo, however fails to explicitly disclose the mixture stream being introduced to the combustion section.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use this mixture stream (which contains unreacted hydrogen) to the combustion section in order to maximize thermal efficiency of the system.

Regarding claims 15 and 16, the claimed structural limitations do not incorporate any new material but simply re-arrange the claimed apparatus into a "package structure". It would have been obvious to one of ordinary skill in the art at the time of the invention to re-arrange the self-oxidation internal heating steam reforming system to meet the needs of a certain "package structure". Such modification is a mere rearrangement of the system parts that would not modify the operation of the system, and would have been obvious to one of ordinary skill in the art at the time of the invention. See In re Japikse, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950).

Regarding claim 26, Tetsuo, as discussed in claim 1 above, further discloses:

the reformed gas is supplied to a fuel cell (see flow diagram of Figs. 1-5); and

a recycler (see Drawings 3 and 4) for supplying at least a part of an anode flue gas (13) discharged from the fuel cell as the raw material (instead of raw material from (4)) gas is disposed.

Response to Arguments

5. The objection to claim 11 has been withdrawn in light of the amendment.

6. Applicant's arguments filed 12/21/07 have been fully considered but they are not persuasive.

7. On page 16, paragraph 3, Applicant argues that Maruko does not teach a heat transfer particle bed. The examiner respectfully disagrees. The particle bed of Maruko does indeed transfer heat through the partition wall (see layout in Fig. 5).

8. Applicant's arguments with respect to claim 1 have been considered but are moot in view of the new ground(s) of rejection necessitated by amendment

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW J. MERKLING whose telephone number is (571)272-9813. The examiner can normally be reached on M-F 8:30-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. J. M./
Examiner, Art Unit 1795

/Alexa D. Neckel/
Supervisory Patent Examiner, Art Unit 1795